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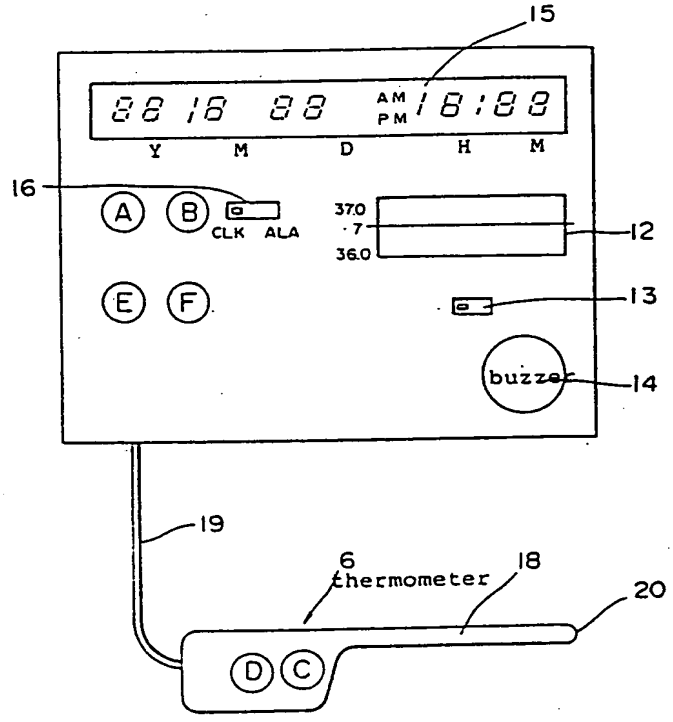
# (54) Fertility indicating thermometer

(57) An apparatus for storing and displaying body temperature comprising a calender/clock, a clinical thermometer 6 for measuring a woman's basal body temperature each day and producing a digital output signal, a memory unit for storing the data output by said clinical thermometer with the date and time of measurement, a processing circuit for judging and pr dicting whether a woman is fertile on the basis of the data from said clinical thermometer and the data expressing Mr Ogino's theory, and a display means 15, 12 for displaying the output of said calender/clock, the output of said clinical thermometer, and the data processed by said processing circuit. The data displayed may also include a graph of actual and predicted temperature fluctuation.

FIG. 2

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SPECIFICATION

**Apparatus for st ring and displaying body temperature**

BACKGROUND OF THE INVENTION

*Field of the invention*

The present invention relates to an apparatus for storing and displaying body temperature which is capable of measuring the body temperature of a human and storing its value. More particularly, the invention pertains to an apparatus for storing and displaying body temperature which is improved so that it can measure the basal body temperature of a woman and judge whether or not that woman is in a fertile period.

*Description of the prior art*

Heretofore, a basal body temperature method has been used to determine whether a woman is in her fertile period or not. This method, however, is irksome in that it requires the woman to plot the measured value on a graph each time her temperature is taken. In addition, time-consuming calculations are required to forecast the next fertile period on the basis of the above-mentioned values on the graph.

Basal body temperature is also used for the diagnosis of women's diseases. In this case, however, the gynecologist has to take into account the possibility of the patient misreading the thermometer.

*Summary of the invention*

In view of the above-described problems, it is a primary object of the present invention to provide an apparatus for storing and displaying body temperature which is improved so that it can record and display basal body temperature in a simple manner. Another object of the invention is to provide an apparatus for storing and displaying body temperature which makes it possible to see at a glance whether a woman is in a fertile period.

To these ends, present invention provides an apparatus for storing and displaying body temperature which comprises a calender/clock which serves as a calendar, a clinical thermometer for measuring body temperature and producing a digital signal corresponding to that temperature, a memory for storing data representing the temperature measured by the clinical thermometer, a processing circuit for judging and predicting whether a woman is pregnable on the basis of the data obtained by the clinical thermometer and Mr. Ogino's data, and a display means for displaying the output of the calender/clock, the output of the clinical thermometer, and the estimated basal body temperature and estimated fertile period which are information processed by the processing circuit.

*Brief description of the drawings*

*Figure 1* is a block diagram of an embodiment of the present invention, showing its electrical configuration;

*Figure 2* is a schematic front view of the apparatus for storing and displaying body temperature according to the present invention;

*Figure 3* is a graph showing daily changes in body temperatures;

*Figure 4* is an enlarged detail view of the display section 12; and

*Figure 5* is a flowchart used for explaining the operation of an embodiment of the present invention.

*Description of the preferred embodiments*

Referring first to Figure 1, a calender/clock 4 functions as a calender, i.e., it sends digital signals representing the date and time to a CPU (central processing unit) 1. A ROM (read-only memory) 3 is adapted to store data expressing the theory established by Mr. Ogino as well as a program used for operating the CPU 1. A RAM (random-access memory) 2 stores the data sent from a clinical thermometer 6 and the calender/clock 4. A display 5 displays the data which are produced by the CPU 1 and the clinical thermometer 6, as well as the data and time output by the calender clock 4.

Referring next to Figure 2, a display section 15 and a display section 12 together correspond to the display 5 of Figure 1. The display section 15 acts as a calender, i.e., it displays the current data and time. The display section 12 displays temperatures in the form of a bar graph with dates along the abscissa and temperatures along the ordinate. The display of the calender by the display section 15 can be changed over to a wake-up time by means of a switch 16. A switch 13 turns on and off the display of the display section 12. A piezo-electric buzzer 14 generates a wake-up alarm, and also produces an operation confirmation sound. The calender/clock of the display section 15 and the contents of the display section 12 are adjusted by a pushbutton A. The wake-up time is adjusted by a pushbutton B. Pushbuttons E and F are both employed when reading out the contents of the RAM shown in Figure 1 or when displaying past and future basal body temperatures, as well as estimated fertile days. Pushbutton E is used for moving dates backward and pushbutton F for moving them forward.

The clinical thermometer 6, as shown in Figure 2, has a sensor 20, a temperature-measuring body 18, a pushbutton C, a pushbutton D, and a lead wire 19. The clinical thermometer 6 measures temperature by its sensor 20 and transmits a digital signal corresponding to the measured temperature data to the CPU 1 through the lead wire 19. The pushbutton D is used when starting the operation of the apparatus and when writing data in the RAM 2. The pushbutton C acts as a switch for confirming that the operator is awake, and is operated when the wake-up buzzer is stopped. Pushbutton C is necessary because the basal body temperature must be taken while lying quietly in bed immediately after waking in the morning.

Figure 3 shows a graph of the basal body t m-perature of a woman, showing how her temperature fluctuates over about 90 days. The menstrual cycle of this woman can be seen from the graph to be about 30 days long.

Temperature rises when ovulation occurs, and falls when menstruation commences. The basal body temperature of a woman can be slightly above

or below normal, depending on the individual. However, if a temperature of 36.7°C is taken as standard, a normal woman has a repetative tow-phase cycle in which higher temperatures are referred to as the high-temperature phase, and the lower temperatures of the cycle are referred to as the low-temperature phase. Since ova and spermatozoa can survive for a certain period, a woman can become pregnant during several days around ovulation.

Figure 4 is a graph of basal body temperatures over a period of 90 days, which are sequentially indicated day by day. The temperatures for the 60 days in the left part of the Figure represent those which were actually measured. On the other hand, those for the 30 days on the right are the estimated results calculated by the processing circuit on the basis of the data on basal body temperatures which had been taken for 60 the days shown on the left in the graph, and before that period. The temperatures in the portion with an indicator H in the display section 12 are estimated. An indicator J indicates the fertile periods and an estimated fertile period which is calculated on the basis of the data on measured basal body temperatures and the data representing the Ogino method. The date displayed by the display section 15 is indicated by an indicator K in the display section 12.

The operation of the apparatus will be described hereinunder with reference to the flowchart of Figure 5.

In Figure 5, the apparatus is started in Step m1, and the process proceeds to Step m2. In Step m2, the year, month, day, and time, which are displayed in the display section 15, are adjusted by pressing pushbutton A shown in Figure 2. Thereafter, in Step m3, the switch 16 is moved to ALA so that the display section 15 displays the time at which an alarm is set. In Step m4, a wake-up time is selected by pressing pushbutton B. In Step m5, the switch 16 is moved to CLOCK so that the display section 15 displays the date.

In Step m6, the piezo-electric buzzer 14 goes off at the wake-up time the next morning, which is set in the above-mentioned manner, making a wake-up noise. In Step m7, the buzzer is then stopped by pressing pushbutton C. Subsequently, in Step m8, temperature taking is started by pressing pushbutton D while placing the sensor 20 of the clinical thermometer 6 in the mouth. In Step m9, the piezo-electric buzzer 14 goes off when the temperature taking is completed, indicating that the temperature has been taken. The process proceeds to Step m10 in which the value of the temperature as well as the calender date at that time are stored in the RAM 2 by pressing pushbutton D. In addition, the indicator sound from the buzzer is stopped in Step m9. The thus-obtained temperature is displayed in the display section 12 in Step m11. For example, a display section 12 such as shown in Figure 4 displays the basal body temperatures for 90 days. In this way, a temperature graph is sequentially drawn day by day.

Subsequently, the switch 13 is moved to OFF in Step m12, so as to turn off the display of the temperature by the display section 12.

The process then proceeds to Step m13 in which it is necessary todecide whether to display past calender dates and corresponding temperatures. If it is decided to display them, Step m14 is executed in which the switch 13 is set to ON. In Step m15, the individual data items are displayed in the display section 15 and 12. The contents of the displays of the display sections 15 and 12 at that time are past dates and times and the corresponding basal body temperatures, respectively.

In this way, it is possible to make the past calender data and the corresponding basal body temperatures into a graph and display them on the display section 12, so that it is not necessary to manually plot them on graph paper. To determine whether that woman is in her fertile period on the basis of the past calender content and the data representing the corresponding temperatures obtained in Step m13, the process proceeds to Step m21. In Step m21, a calculation is done to determine whether the measured temperature is higher or lower than the mean basal body temperature of 36.7°C shown in Figure 3. The mean basal body temperature is obtained from the mean value of the temperature data, since it varies from individual to individual. The cycle of the temperatures shown in the graph of Figure 3 is then calculated in Step m22, and the next cycle is predicted in Step m23. If a first cycle starts on March 31, for example, it is calculated that the second cycle will begin on April 30. In Step m24, the dates of the high-temperature phase and the low-temperature phase are estimated; and in Step m25, a judgement is made as to whether that woman is in her fertile period. If it is decided that she is, the indicator J in the display section 12 flashes.

The judgement as to whether the woman is in her fertile period can be done, since data expressing the Ogino method is already stored in the ROM 3.

Subsequently, if it is decided in Step m27 not to display the past and future basal body temperatures, the process proceeds to Step m27. Otherwise, Step m31 is then executed.

In Step m31, the temperatures are displayed in the display section 12 by moving the switch 13 to ON. If it is decided to display the past data in Step m32, Step m33 is executed in which the past data, represented by the output of the calender/clock 4 of the display section 15 and the dates and basal body temperatures of the display section 12, is displayed by pressing the pushbutton E of Figure 2. The contents of the display can be changed, and the data corresponding to any desired date and its surroundings can be selected by pressing pushbutton E.

To know future basal body temperatures and future fertile periods, the process proceeds from Step m35 to Step m36.

In Step m36, the estimated future basal body temperatures, represented by the output of the calender/clock 4 as well as by the dates and basal body temperatures 12, are displayed by the display sections 15 and 12, respectively, by pressing pushbutton F of Figure 2. The indicator H is attached to the estimated temperatures, and the indicator J is given to the estimated fertile periods.

If it is not necessary to display the future data, the display of the display section 12 is changed to the

that of temperature in Step m37, by moving the switch 13 to OFF. The contents of the display section 15 may alternatively be displayed by the display section 12. A bar graph may be employed in place of the graph such as shown in Figures 3 and 4.

According to the present invention, the basal body temperatures can be automatically and sequentially made into a graph day by day, by means of which it is possible to estimate future fertile periods or sterile periods and to discover pregnancy and diseases specific to women at an early stage.

In addition, the display section 12 of the apparatus of the invention may alternatively be used such as to display biorhythms. The application of the apparatus of the invention is not limited to women, and it may also serve as a health care instrument for anybody including the sick and infants.

The stored data may be output by a printer such as to obtain hard copy, and input into a computer so that it can be used for medical analysis.

CLAIMS

1. An apparatus for storing and displaying body temperature, said apparatus comprising: a clinical thermometer for measuring the body temperature of a human and generating a digital signal corresponding to said temperature; a memory unit for storing the data output by said clinical thermometer; and a display means for displaying the output of said clinical thermometer.

2. An apparatus for storing and displaying body temperature, said apparatus comprising: a calender/clock functioning as a calender; a clinical thermometer for measuring a woman's basal body temperature and producing a digital signal corresponding to said temperature; a memory unit for storing the data output by said clinical thermometer; a processing circuit for judging and predicting whether a woman is fertile on the basis of the data from said clinical thermometer and the data expressing Mr. Ogino's theory; and a display means for displaying the output of said calender/clock, the output of said clinical thermometer, and the data processed by said processing circuit.

3. Body temperature measuring apparatus substantially as here described with reference to the accompanying drawings.

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FIG. 1

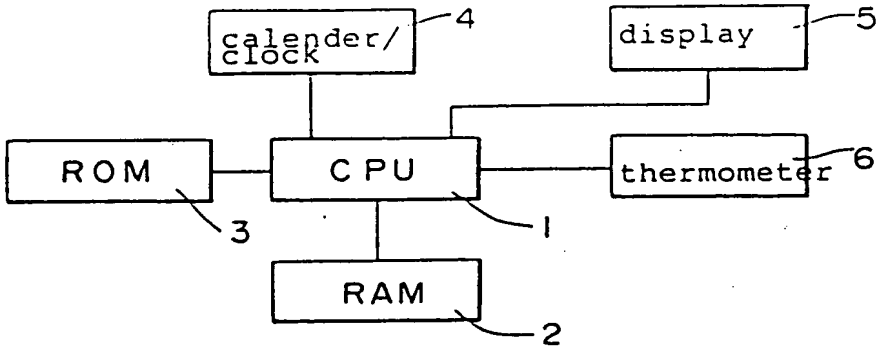



FIG. 2

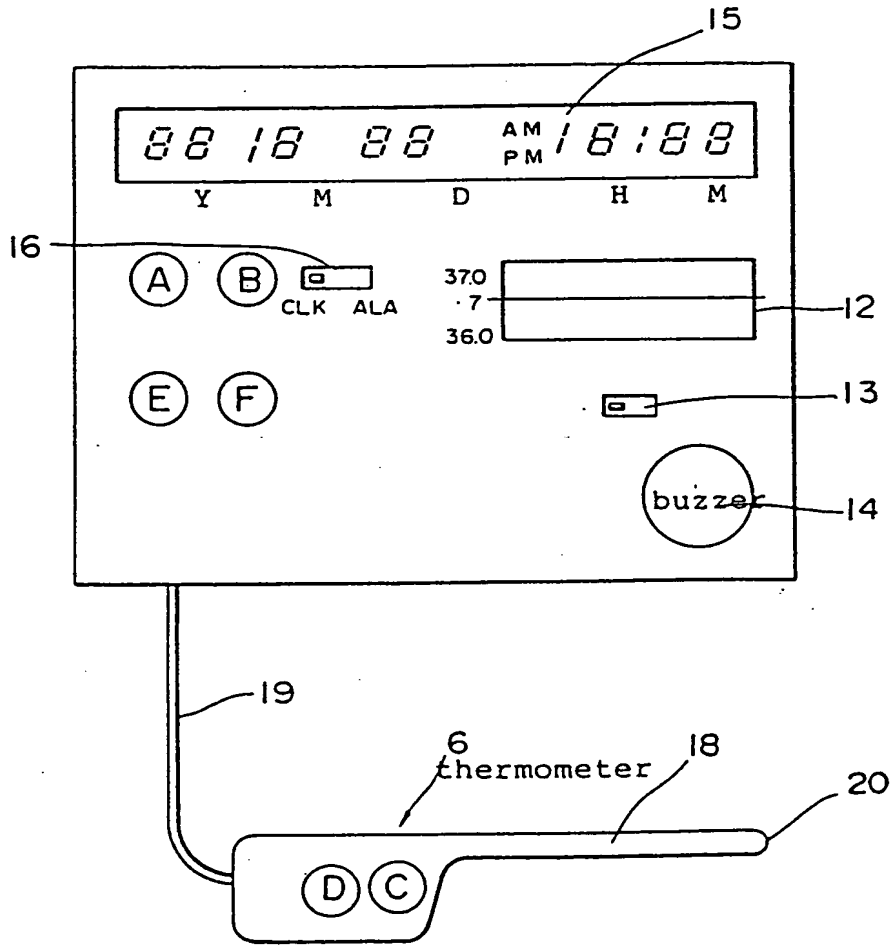
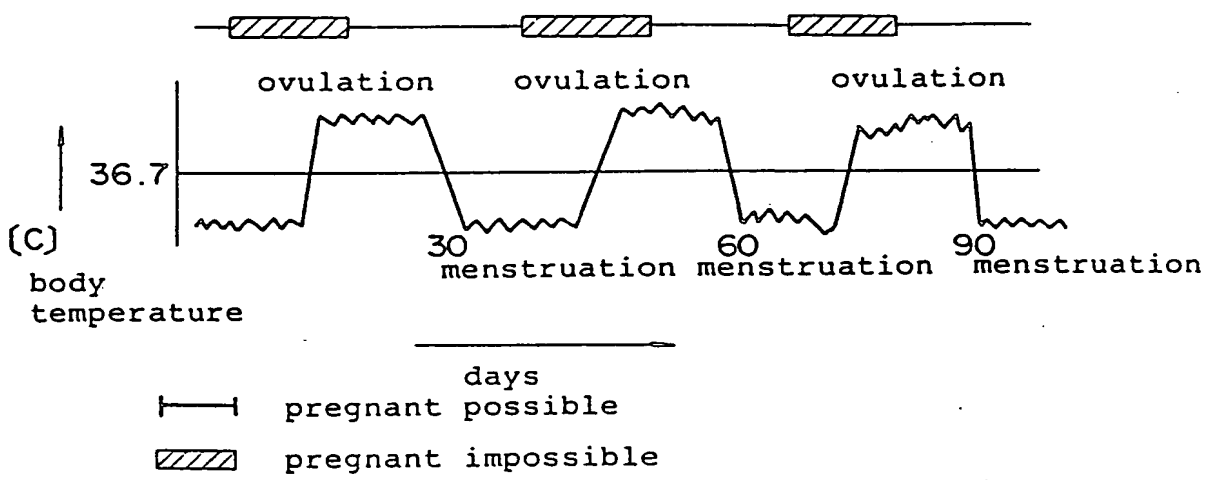


FIG. 3



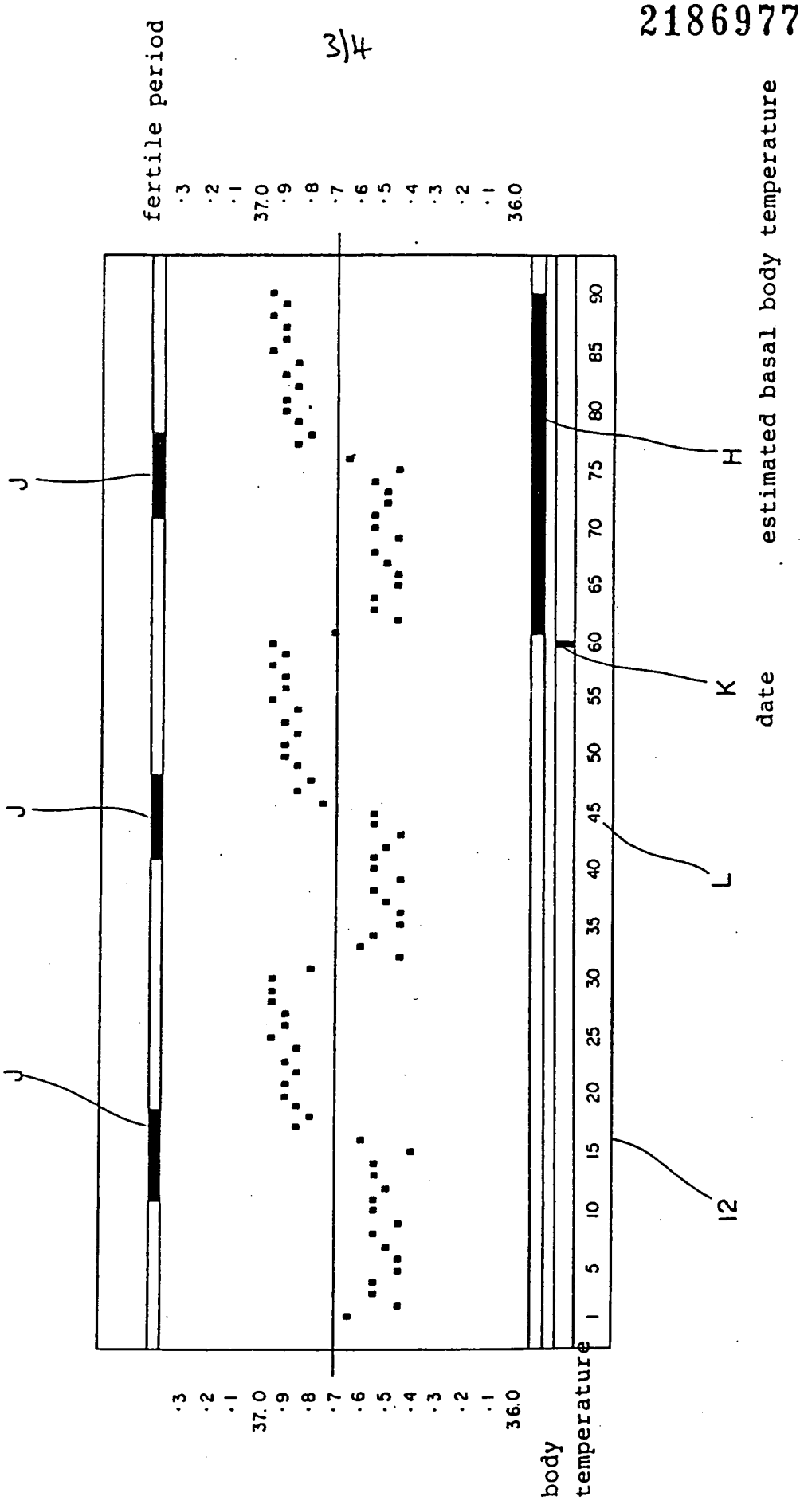

fertile period
.3
.2
.1
37.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
36.0
J
J
J
H
K
L
12
1
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
date
estimated basal body temperature
body temperature

FIG. 4

P.O. Original

FIG. 5



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